

CLAIMS

1. A dielectric material comprising:

an amalgamation layer having a nanoporous aerogel and a blending material, said nanoporous aerogel having a plurality of pores and said blending material further comprising a reinforcing component and a volatile component.
2. The dielectric material of claim 1, wherein the nanoporous aerogel is a powder.
3. The dielectric material of claim 2, wherein the powder is subsequently cross-linked following an additional treating stage.
4. The dielectric material of claim 1, wherein the blending material has a dielectric constant no more than 3.0 prior to combining the blending material and the nanoporous aerogel.
5. The dielectric material of claim 1, wherein the pores have a sphere equivalent mean diameter of less than 100 nanometers.
6. The dielectric material of claim 1, wherein the pores have a sphere equivalent mean diameter of less than 10 nanometers.
7. The dielectric material of claim 1, wherein the reinforcing component substantially comprises a polymer.
8. The dielectric material of claim 7, wherein the polymer comprises poly(arylene ether).
9. The dielectric material of claim 1, wherein the volatile component is polar.
10. An electronic component comprising the dielectric material of claim 1.
11. The component of claim 10, wherein the dielectric material is a film.
12. The component of claim 10, wherein the component is a circuit chip.

13. A method of forming the dielectric material of claim 1 comprising:

providing a nanoporous aerogel precursor material;

treating the nanoporous aerogel precursor material to form the nanoporous aerogel;

providing the blending material having the reinforcing component and the volatile component;

combining the nanoporous aerogel and the blending material to form the amalgamation layer,

and

treating the amalgamation layer to remove a substantial amount of the volatile component,
thereby increasing the mechanical strength of the amalgamation layer and significantly
decreasing the dielectric constant of the dielectric material.
14. The method of claim 13, wherein the nanoporous aerogel precursor material substantially
comprises an organic polymer.
15. The method of claim 14, wherein the polymer is poly(arylene ether).
16. The method of claim 13, wherein the nanoporous aerogel precursor material substantially
comprises an organic-inorganic hybrid compound.
17. The method of claim 16, wherein the organic-inorganic hybrid compound comprises
essentially poly(arylene ether) and a silica-based compound.
18. The method of claim 13, wherein treating the nanoporous aerogel precursor material to form
the nanoporous aerogel comprises using a supercritical drying process to form the
nanoporous aerogel.
19. The method of claim 13, wherein decreasing the dielectric constant comprises a decrease of at
least 10%.
20. The method of claim 13, wherein decreasing the dielectric constant comprises a decrease of at
least 30%.

21. The method of claim 13, wherein the substrate layer is a silicon wafer.
22. The method of claim 13, wherein the blending material has a dielectric constant no more than 3.0 prior to combining the blending material with the nanoporous aerogel, decreasing the dielectric constant comprises an decrease of at least 30%, the nanoporous aerogel precursor material comprises a polymer, the pores have a sphere equivalent mean diameter of less than 100 nanometers, the volatile component is a mixed gas, and the reinforcing component is a polymer.
23. The method of claim 13, wherein the blending material has a dielectric constant no more than 2.0 prior to combining the blending material with the nanoporous aerogel, decreasing the dielectric constant comprises an decrease of at least 10%, the nanoporous aerogel precursor material comprises a organic-inorganic hybrid material, the pores have a mean diameter of less than 100 nanometers, the volatile component is a mixed gas, and the reinforcing component is a poly(arylene ether).